### (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

# (19) World Intellectual Property Organization International Bureau



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## (43) International Publication Date 5 August 2004 (05.08.2004)

### **PCT**

# (10) International Publication Number WO 2004/066121 A3

- (51) International Patent Classification<sup>7</sup>: B01D 13/00, C02F 1/44
- A61M 37/00,
- (21) International Application Number:

PCT/US2004/000921

- (22) International Filing Date: 14 January 2004 (14.01.2004)
- (25) Filing Language:

English

(26) Publication Language:

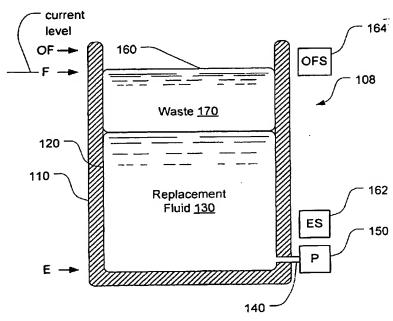
English

- (30) **Priority Data:** 60/440,176 15 Jan
  - 15 January 2003 (15.01.2003) US
- (71) Applicant (for all designated States except US): NXSTAGE MEDICAL INC. [US/US]; 439 South Union Street, 5th Floor, Lawrence, Massachusetts 01843 (US).
- (71) Applicants and
- (72) Inventors: BRUGGER, James M. [US/US]; 4 Savory Street, Newburyport, Massachusetts 01950 (US). BUR-BANK, Jeffrey M. [US/US]; 18 Sunrise Road, Boxford, Massuchusetts 10920 (US).

- (74) Agent: CATAN, Mark; Proskauer Rose LLP, Patent Department, 1585 Broadway, New York, New York 10036 (US).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: WASTE BALANCING FOR EXTRACORPOREAL BLOOD TREATMENT SYSTEMS



(57) Abstract: One or more waste balancing systems (108) may be used in a fluid circulating system for medical use. The fluid circulating system may be part of a blood treatment system for a patient suffering renal failure. A waste balancing system may include a pressure element operable to maintain a constant fluid pressure created by the combined weight of waste removed (170) from a patient and replacement fluid (130) for providing to a patient. Multiple evaluation characteristics or control parameters may be evaluated or controlled for safety and accuracy. At least part of the waste balancing system may be incorporated into a disposable cartridge.



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#### Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
- (88) Date of publication of the international search report: 25 November 2004
- (15) Information about Correction:
  Previous Correction:

see PCT Gazette No. 40/2004 of 30 September 2004, Section II

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

### INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/00921

| A. CLASSIFICATION OF SUBJECT MATTER  |  |   |                                   |
|--|--|---|-----------------------------------|
| IPC(7) : A61M 37/00, B01D 13/00, C02F 1/44   |  |   |                                   |
| US CL : 210/645,646,321.71; 604/5.04,6.09,6.11   |  |   |                                   |
| According to International Patent Classification (IPC) or to both national classification and IPC  |  |   |                                   |
| B. FIELDS SEARCHED   |  |   |                                   |
| Minimum documentation searched (classification system followed by classification symbols)  |  |   |                                   |
| U.S.: 210/645,646,321.71; 604/5.04,6.09,6.11   |  |   |                                   |
| 0.5. : 2   | 10/043,040,321.71, 004/3.04,0.02,0.11  |   |                                   |
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| C. DOCUMENTS CONSIDERED TO BE RELEVANT   |  |   |                                   |
| Category *   | Citation of document, with indication, where ap  | propriate, of the relevant passages   | Relevant to claim No.             |
|  | US 4,661,246 A (ASH et al) 28 April 1987 (28.04.1  | 987) entire document:   | 1-34                              |
| Y  | US 4,001,240 A (ASH et al) 20 April 1907 (20.04.1  | 707), ontile commens  | 1                                 |
|  | US 5,641,405 A (KESHAVIAH et al) 24 June 1997 (24.06.1997), entire document.   |   |                                   |
| Y  | US 5,641,405 A (RESHAVIAH et al) 24 Julie 1997 (24.00.1997), Chille document.  |   |                                   |
|  | 1-34   |   |                                   |
| Y  | US 5,344,568 A (KITABVICH et al) 06 September 1994 (06.09.1994), entire document.  |   |                                   |
|  | 77 77 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1  |   | 1-34                              |
| Y  | US 4,728,433 A (BUCK et al) 01 March 1988 (01.03.1988), entire document.   |   | 1-54                              |
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| "P" documen  | at published prior to the international filing date but later than the   | "&" document member of the same patent  | family                            |
| priority date claimed  |  |   |                                   |
| Date of the actual completion of the international search  Date of mailing of the international search report  |  |   |                                   |
| Date of the  | actual completion of the international source  | 15 OCT 200  | <i>A</i> : -                      |
| 20 September 2004 (20.09.2004)   |  |   |                                   |
| Name and mailing address of the ISA/US   |  | Authorized officer  |                                   |
| Mail Stop PCT, Attn: ISA/US  |  | Much Har  |                                   |
| Commissioner for Patents   |  | Leslie R. Deak  |                                   |
| P.O. Box 1450  |  | Telephone No. 703-308-0873  |                                   |
| Alexandria, Virginia 22313-1450  Fossimile No. (703) 305-3230  |  |   |                                   |
| I Paccimile N  | 0 (701) 303-3730   | ı   |                                   |